BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/761,486	01/16/2001	Wen-Chih Chiou	67,200-306	6239

7590 07/31/2002

TUNG & ASSOCIATES
Suite 120
838 W. Long Lake Road
Bloomfield Hills, MI 48302

EXAMINER	
MARKHAM, WESLEY D	
ART UNIT	PAPER NUMBER
1762	6

DATE MAILED: 07/31/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

/

AS-6

Office Action Summary	Application No.	Applicant(s)	
	09/761,486	CHIOU ET AL.	
	Examiner	Art Unit	
	Wesley D Markham	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Peri d for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 March 2002 and 01 May 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 January 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Acknowledgement is made of applicant's amendment A, filed as paper #3 on 3/12/2002, and applicant's amendment B, filed as paper #5 on 5/1/2002, in which the specification of the instant application was amended, a new abstract of the disclosure was submitted, and Claims 1, 11, 13, 14, and 17 were amended. Claims 1 – 17 are currently pending in U.S. Application Serial No. 09/761,486, and an Office Action on the merits follows.

Drawings

1. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.
2. The objection to the drawings (specifically Figures 4 and 5), set forth in paragraph 2 of the previous Office Action, is maintained as no corrected drawings or proposed drawing corrections have been submitted by the applicant to this point.

Specification

3. The objections to the specification (including the abstract of the disclosure), set forth in paragraphs 3 – 4 of the previous Office Action, are withdrawn in light of applicant's amendment B in which an acceptable abstract of the disclosure was submitted and the specification was amended.

Claim Objections

4. The objections to Claims 11, 14, and 17, set forth in paragraphs 5, 7, and 8 of the previous Office Action, are withdrawn in light of applicant's amendment B.

5. The objection to Claim 12, set forth in paragraph 6 of the previous Office Action, is maintained because no amendment was made to Claim 12 to correct the term "reflective index (n)" to read "refractive index (n)".

6. Claim 9 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim (specifically independent Claim 1). Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Amended independent Claim 1 requires an annealing temperature of at least 500° C, and the limitation in dependent Claim 9 that the annealing temperature is between about 400° C and about 1000° C does not further limit the aforementioned limitation of Claim 1. For the purposes of examination and in order to correspond to the applicant's amendments and remarks filed on 5/1/2002, Claim 9 has been reasonably interpreted to require an annealing temperature of at least 500° C and between about 400° C and about 1000° C (i.e., between 500° C and about 1000° C).

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that formed the basis for the rejections under this section made in the previous Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

8. The rejection of Claims 1, 2, 5, 8 – 11, and 13 – 16 under 35 U.S.C. 102(e) as being anticipated by Plat et al. (USPN 6,265,751 B1), set forth in paragraphs 10 – 12 of the previous Office Action, is withdrawn in light of applicant's amendment B in which independent Claims 1 and 13 were amended to require an annealing / heating temperature of at least 500° C instead of at least 400° C as required by the originally filed claims. Plat et al. explicitly teach annealing temperatures of up to 482° C.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 1, 2, 5, 8 – 11, and 13 – 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Plat et al. (USPN 6,265,751 B1) in view of Abernathey et al. (USPN 4,725,560).

12. Specifically, Plat et al. teach all the limitations of Claims 1, 2, 5, 8 – 11, and 13 – 16 as set forth in paragraphs 11 – 12 of the previous Office Action, except for a method wherein the annealing / heat treating step is carried out at a temperature of at least 500° C (independent Claim 1), particularly between about 500° C and about 1000° C (independent Claim 13). However, Plat et al. do teach annealing the SiON antireflective coating (ARC) in oxygen gas at a temperature up to 900 degrees Fahrenheit (482° C) for a time period of between approximately 5 and 30 minutes (Col.6, lines 59 – 65). This annealing is performed to condense / increase the density of the SiON ARC (Col.6, lines 65 – 67). Abernathey et al. teach that, in the

art of fabricating semiconductor memory devices (Col.1, lines 8 – 12) (i.e., a process corresponding to that of Plat et al.), it was known at the time of the applicant's invention to anneal a deposited SiON film in oxygen gas at a temperature between 700° C and 1000° C (i.e., a temperature within the range claimed by the applicant) in order to densify the film (Col.3, lines 30 – 37 and Col.5, lines 35 – 43). Therefore, it would have been obvious to one of ordinary skill in the art to densify the SiON ARC of Plat et al. in oxygen gas at a temperature in the range claimed by the applicant (as taught by Abernathey et al.) with the reasonable expectation of (1) success, as Abernathey et al. teach that annealing an SiON film at a temperature between 700° C and 1000° C in oxygen gas successfully densifies the film as desired by Plat et al., and (2) obtaining the benefits of performing the annealing process at a higher temperature, such as minimizing / reducing annealing time, thereby leading to higher process throughput. Please note that no criticality has been established for an annealing temperature of above 500° C as opposed to an annealing temperature of above 400° C as originally claimed.

13. Claims 3 – 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Plat et al. (USPN 6,265,751 B1) in view of Abernathey et al. (USPN 4,725,560), and in further view of Chang et al. (USPN 6,130,146) for the reasons set forth above in paragraph 12 and in paragraphs 15 – 16 of the previous Office Action.

14. Claims 1, 2, 6, 8 – 11, and 13 – 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holscher et al. (USPN 6,274,292 B1) in view of Plat et al. (USPN 6,265,751 B1) for the reasons set forth in paragraphs 17 – 19 of the previous Office Action.

15. Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holscher et al. (USPN 6,274,292 B1) in view of Plat et al. (USPN 6,265,751 B1), and in further view of Chang et al. (USPN 6,130,146) for the reasons set forth in paragraphs 20 – 22 of the previous Office Action.

16. Claims 5, 7, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holscher et al. (USPN 6,274,292 B1) in view of Plat et al. (USPN 6,265,751 B1), and in further view of Sandhu et al. (USPN 6,268,282 B1) for the reasons set forth in paragraphs 23 – 25 of the previous Office Action. Regarding Claim 17 which requires that the heating step be performed at a temperature between 500° C and 700° C, Holscher et al.'s teaching of a heat treatment at a temperature of greater than about 400° C (Abstract) and explicit teaching of heat treatment temperatures of from about 800° C to about 1050° C (Col.3, lines 30 – 33) clearly overlaps the applicant's claimed temperature range. Overlapping ranges are *prima facie* evidence of obviousness (*In re Malagari*, 184 USPQ 549 (CCPA 1974)).

17. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Holscher et al. (USPN 6,274,292 B1) in view of Plat et al. (USPN 6,265,751 B1), and in further view of either Lee (USPN 6,300,672 B1) or Yao et al. (USPN 6,258,734 B1) for the reasons set forth in paragraphs 26 – 27 of the previous Office Action.

Response to Arguments

18. Applicant's arguments filed on 5/1/2002 have been fully considered but they are not persuasive.

19. First, regarding the applicant's arguments against the 35 U.S.C. 102(e) rejections based on Plat et al., the arguments are moot based on the new grounds of rejection set forth above in paragraphs 11 – 13.

20. Second, the applicant argues that Plat et al. do not teach the deposition of SiONH or SiO_2. In response, the applicant's claims do not require the deposition of SiONH or SiO_2. The claims require the deposition of SiO_2, SiONH, or SiON. Plat et al. teach the deposition of SiON, as required by the claims.

21. Third, regarding Claim 14, the applicant argues that Plat et al. clearly does not teach annealing the ARC layer in order to vary the extinction coefficient by at least 10%. In response, the examiner agrees that Plat et al. do not explicitly teach this limitation. However, the combination of Plat et al. and Abernathey et al. teaches all the process steps and limitations of the applicant's claim. Specifically, the combination teaches performing the applicant's claimed process at temperatures in the range claimed and disclosed by the applicant. In addition, Plat et al. teach an annealing time of up to 30 minutes (Col.6, lines 63 – 64), which is the same upper limit for annealing time contemplated by the applicant. Therefore, unless essential process limitations are missing from the applicant's claims, the method of the

combination of Plat et al. and Abernathey et al. would have inherently varied the extinction coefficient of the ARC layer by at least 10% as claimed by the applicant.

22. Fourth, the applicant appears to argue the criticality of the process step of depositing a dielectric ARC layer on the SiNx or polysilicon layer. For support, the applicant cites the specification at page 3, line 8 through page 4, line 1. In response, the cited portion of the specification has been reviewed by the examiner. The examiner notes that the cited portion of the specification appears to teach the benefits of utilizing a dielectric ARC (SiO_2, SiON, or SiONH) instead of an organic ARC or inorganic ARC such as TiN or TiW. It does not show or suggest any criticality of either a polysilicon layer or a silicon nitride layer. Briefly, both Holscher et al. and Plat et al. are drawn to utilizing dielectric ARCs as disclosed and claimed by the applicant, not organic ARCs or inorganic ARCs such as TiN or TiW. Both are concerned with providing an effective ARC layer that can be utilized to suppress reflected radiation in later photoresist patterning procedures. Importantly, Holscher et al. teach that the semiconductive substrate on which the ARC layer is deposited includes a semiconductor wafer alone as well as assemblies comprising other materials thereon (Col.2, lines 46 – 55). Plat et al. indicate that a polysilicon layer is conventionally used on top of a semiconductor wafer in semiconductor photoresist patterning processes such as the process of Holscher et al. As such and in view of the combined teachings of Holscher et al. and Plat et al., one of ordinary skill in the art would have clearly recognized that an "assembly" of Holscher et al. would have included a semiconductive substrate with a polysilicon layer deposited thereon.

23. Fifth, the applicant argues that the references do not teach forming a dielectric ARC on top of SiNx. In response, the applicant's claims do not require forming a dielectric ARC on top of SiNx. The applicant's claims require forming the dielectric ARC on top of SiNx or a polysilicon layer. The aforementioned references suggest forming the dielectric ARC on top of a polysilicon layer.

Conclusion

24. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

25. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

26. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D Markham whose telephone number is

(703) 308-7557. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.

27. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

28. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Wesley D Markham
Examiner
Art Unit 1762

WDM
July 27, 2002

SHRIVE P. BECK
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700